Central Line-Associated Bloodstream Infection (CLABSI) Prevention

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Healthcare-associated Infections HAI Elimination

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Basics of Infection Prevention
2-Day Mini-Course
October-November 2011

Objectives

- Describe the etiology and epidemiology of central line associated bloodstream infections (CLABSI)
- Identify risks associated with CLABSI
- Identify evidence-based practices for CLABSI prevention
- Describe the development of “bundles” and their impact on CLABSI prevention
- Review CLABSI surveillance

CLABSI Prevention Objectives

- U.S. Health and Human Services (HHS) HAI Action Plan 5-Year Targets
  - Reduce CLABSI by 50% (since 2009 baseline)
  - Achieve 100% compliance with CLIP
- Centers for Medicare and Medicaid Services (CMS) Value-Based Purchasing
  - All US hospitals reporting CLABSI via NHSN, Jan 2011
  - Annual payment update (2%) awarded for hospital participation
  - Will change to “pay-for-performance” in 2013

HHS Action Plan for Prevention of Healthcare-Associated Infections, 2009

Central Line or Central Vascular Catheter

- Intravascular catheter that terminates at or close to the heart or one of the great vessels
  - Nontunneled CVCs (subclavian, jugular
  - Tunneled CVCs (Broviac, Hickman, Groshong)
  - Dialysis catheter (Quinton)
  - Peripherally inserted central catheters (PICCs)
  - Implanted ports (Permacath)
- Used increasingly to provide long-term venous access in all care settings, including outpatient

Note: midline catheters are not in this category

Pathogenesis of CLABSI

More Common Mechanisms

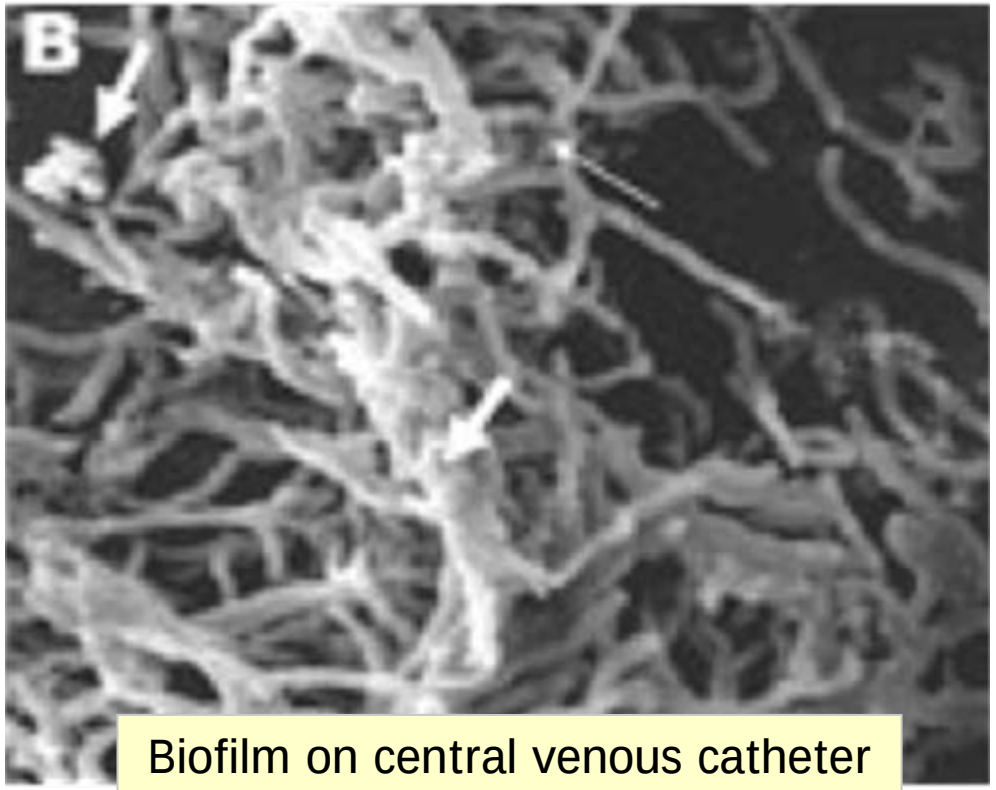
- Pathogens migrate along external surface of catheter
  - More common in early period following insertion, < 7 days
- Hub contamination, migration along internal surface
  - More common >10 days, intraluminal colonization

Less Common Mechanisms

- Hematogenous seeding from another source
- Contaminated infusates

Biofilms

- Complex aggregation of microorganisms growing on a solid substrate
- Form on catheter surfaces
- Contribute to risk for CLABSI

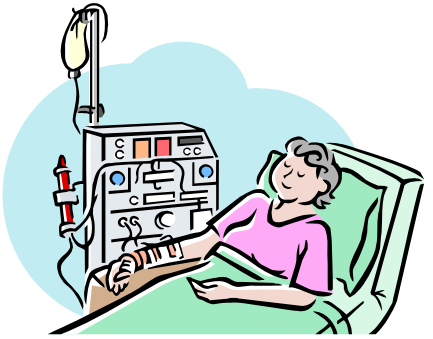


Biofilm on central venous catheter

source www.cdc.gov

CLABSI Risk Factors

- Multiple catheters
- Emergency insertion
- Prolonged duration of CVC
- Prolonged hospital stay prior to CVC insertion
- Excessive manipulation of the catheter
- Neutropenia
- Prematurity
- Total parenteral nutrition



Dialysis patients have many of these risk factors

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Modifiable Factors Vary CLABSI Risk

	Higher CLABSI Risk	**Lower CLABSI Risk**
Insertion circumstances	Emergency insertion	Elective insertion
Skill of inserter	General clinician	Specialized (eg. PICC team)
Insertion site	Femoral	Subclavian
Skin antisepsis	Alcohol (& pov. Iodine)	Chlorhexidine (lowest)
Catheter lumens	Multilumen	Single lumen
Duration of use	Short-term, removed ASAP	Long-term
Barriers for insertion	Anything less than maximal	Maximal

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What is a Bundle?

- Introduced by the Institute for Healthcare Improvement (IHI)
- Groups of practices with high-level clinical evidence of effectiveness
- When applied together, improvements substantially greater
- Benefits of a Bundle
  - Treatment variation is minimized
  - Reliability is enhanced

The whole is greater than the sum of its parts!

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IHI Bundle – Central Line Insertion Practices (CLIP)

Five practices supported by high-level evidence

- Hand Hygiene
- Maximal barrier precautions
- Chlorhexidine skin antisepsis
- Optimal catheter site selection
- Daily review of line necessity

Review of IHI Bundle Components

1. Hand Hygiene
   - Before and after palpating* catheter insertion sites
   - Before and after inserting, replacing, accessing, repairing, or dressing a catheter
   - When hands obviously soiled or contamination suspected
   - Before and after invasive procedures
   - Between patients
   - Before donning and after removing gloves

* Note: palpation of insertion site should not be performed after application of antiseptic unless aseptic technique maintained

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Bundle Components – 2

2. Maximal barrier precautions
   - Wear cap, mask, sterile gown and sterile gloves
     - Both line inserter AND immediate assistant
   - Cover patient from head to toe with sterile drape with small opening for site of insertion

3. Chlorhexidene skin antisepsis
   - Allow time to dry completely before puncturing site

Bundle Components – 3

4. Optimal catheter site selection
   - Subclavian vein the preferred site for non-tunneled catheters in adults

5. Daily review of central line necessity with prompt removal of unnecessary lines
   - Risk of infection increases with line duration

Empower nursing / other health care professionals to
"STOP THE LINE"
if any of Bundle components are missing

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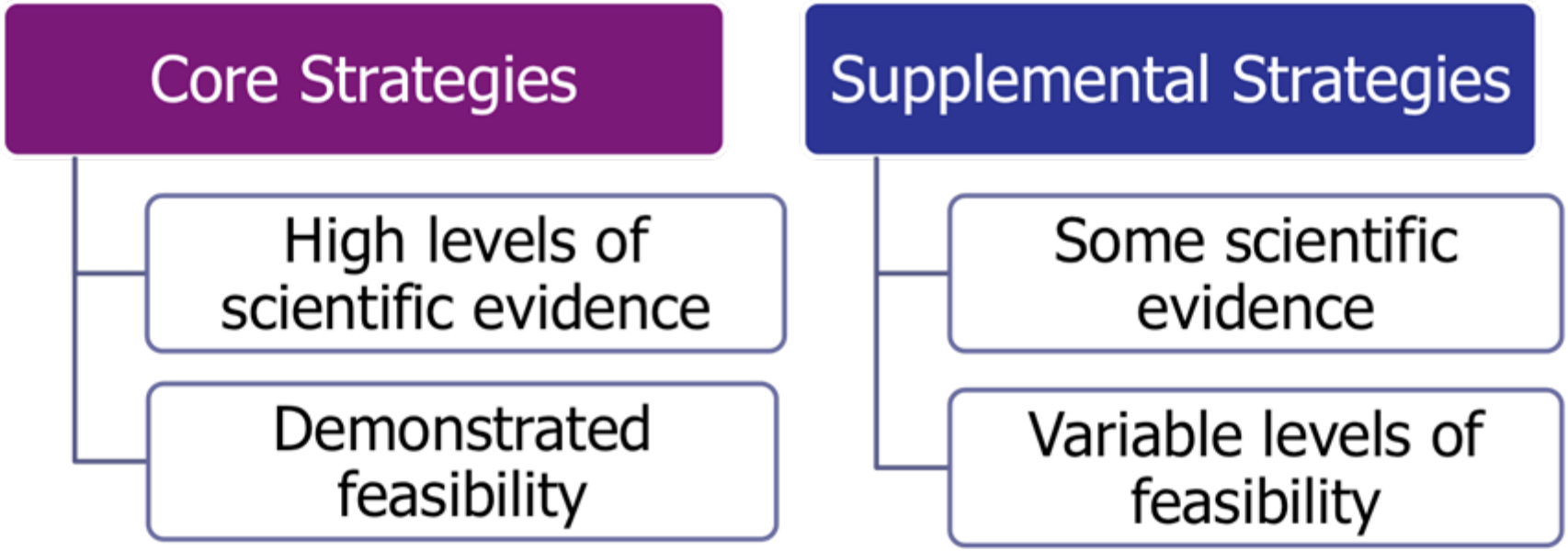
To review

CDC Prevention Strategies



- Should become standard practice

- Consider implementing <u>in addition to Core</u> when infections persist or rates are high

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CLABSI Prevention Strategies

Core

- Remove unnecessary central lines
- Proper insertion practices
- Hand hygiene
- Skin antisepsis
- Lower risk insertion sites
- Hub and access port disinfection
- Educate on central line maintenance and insertion

Supplemental

- Chlorhexidine bathing
- Antimicrobial-impregnated catheters
- Chlorhexidine-impregnated dressings

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Considerations for CLABSI Supplemental Prevention Strategies

Chlorhexidine bathing

- Daily bathing with 2% chlorhexidine decreased BSI rate in ICU compared to soap and water (single study)
- No data outside the ICU

Chlorhexidine dressings

- Chlorhexidine dressings shown to decrease CLABSI rates in some studies, not in others
- May be an option when Core interventions have not decreased CLABSI rates to established goals

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Considerations for CLABSI Supplemental Prevention Strategies

Antimicrobial catheters

- May be appropriate for
  - Patient's catheter expected to be used for >5 days **AND**
  - when Core strategies have not decreased CLABSI rates to established goals
- Studies show some supporting evidence for catheters with Minocycline-Rifampin and Chlorhexidine–Silver Sulfadiazine
- Platinum-Silver catheters available but less evidence to support use

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Measuring Prevention

Requires monitoring for

1. compliance with practices known to reduce infections (**Process** measures)
2. changes in infection rates (**Outcome** measures)

Gould C., Catheter-Associated Urinary Tract infection (CAUTI) Toolkit, CDC

CLABSI Prevention Process Measures

Measure by observation

- Central line insertions
- Hand hygiene
- Proportion of patients with central lines
- Duration of use
- Care and maintenance of line

Ensuring prevention practices are being performed is itself a “core” prevention strategy

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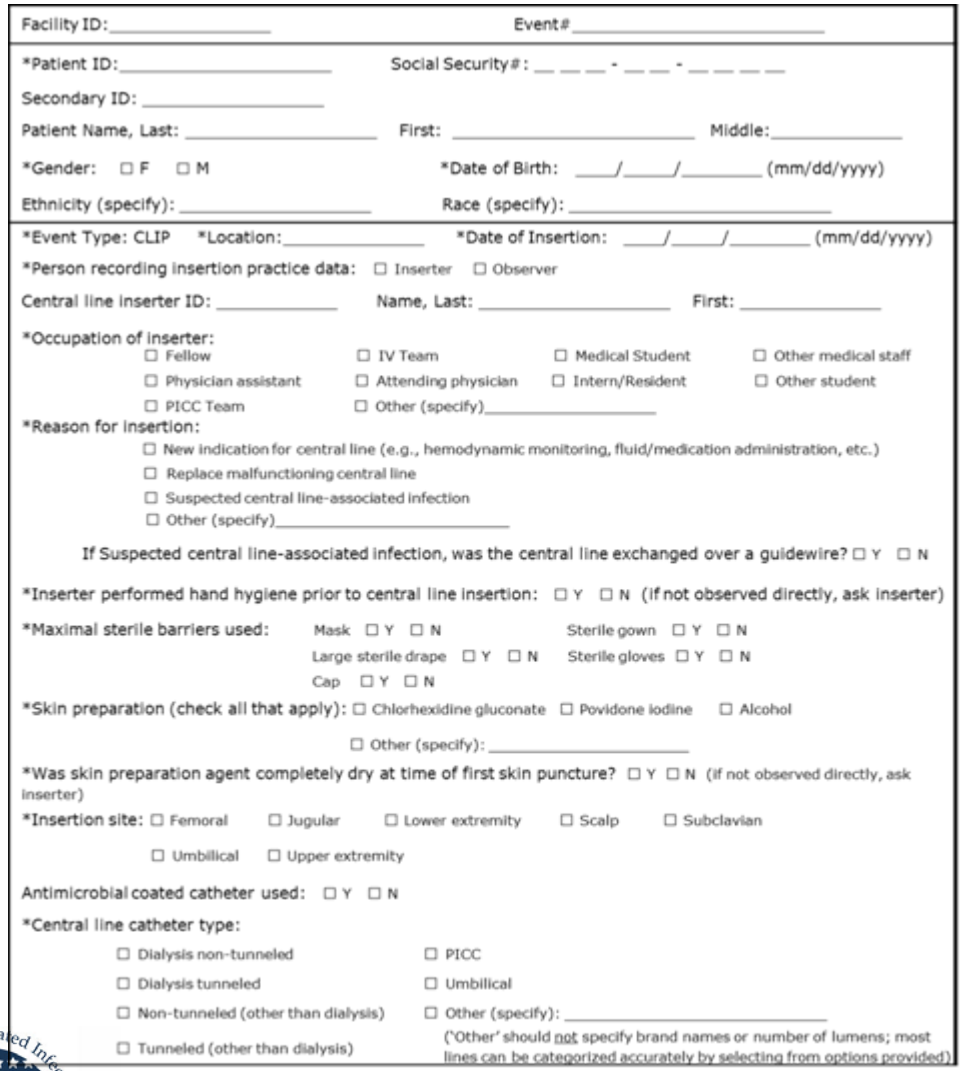
Monitoring Central Line Insertion Practices (CLIP)



Facility ID:_____ Event#_____

*Patient ID:_____ Social Security#: __ __ __ - __ __ - __ __ __ __

Secondary ID: _____

Patient Name, Last: _____ First: _____ Middle:_____

*Gender: ☐ F ☐ M *Date of Birth: ____/____/_____ (mm/dd/yyyy)

Ethnicity (specify): _____ Race (specify): _____

*Event Type: CLIP *Location:_____ *Date of Insertion: ____/____/_____ (mm/dd/yyyy)

*Person recording insertion practice data: ☐ Inserter ☐ Observer

Central line inserter ID: _____ Name, Last: _____ First: _____

*Occupation of inserter:

☐ Fellow ☐ IV Team ☐ Medical Student ☐ Other medical staff

☐ Physician assistant ☐ Attending physician ☐ Intern/Resident ☐ Other student

☐ PICC Team ☐ Other (specify)_____

*Reason for insertion:

☐ New indication for central line (e.g., hemodynamic monitoring, fluid/medication administration, etc.)

☐ Replace malfunctioning central line

☐ Suspected central line-associated infection

☐ Other (specify)_____

If Suspected central line-associated infection, was the central line exchanged over a guidewire? ☐ Y ☐ N

*Inserter performed hand hygiene prior to central line insertion: ☐ Y ☐ N (if not observed directly, ask inserter)

*Maximal sterile barriers used: Mask ☐ Y ☐ N Sterile gown ☐ Y ☐ N

Large sterile drape ☐ Y ☐ N Sterile gloves ☐ Y ☐ N

Cap ☐ Y ☐ N

*Skin preparation (check all that apply): ☐ Chlorhexidine gluconate ☐ Povidone iodine ☐ Alcohol

☐ Other (specify): _____

*Was skin preparation agent completely dry at time of first skin puncture? ☐ Y ☐ N (if not observed directly, ask inserter)

*Insertion site: ☐ Femoral ☐ Jugular ☐ Lower extremity ☐ Scalp ☐ Subclavian

☐ Umbilical ☐ Upper extremity

Antimicrobial coated catheter used: ☐ Y ☐ N

*Central line catheter type:

☐ Dialysis non-tunneled ☐ PICC

☐ Dialysis tunneled ☐ Umbilical

☐ Non-tunneled (other than dialysis) ☐ Other (specify): _____

('Other' should not specify brand names or number of lumens; most lines can be categorized accurately by selecting from options provided)

☐ Tunneled (other than dialysis)

Assurance of Confidentiality: The voluntarily provided information obtained in this surveillance system that would permit identification of any individual or institution is collected with a guarantee that it will be held in confidence, will be used only for the purposes stated, and will not otherwise be disclosed or released without the consent of the individual, or the institution in accordance with Sections 304, 306 and 308(d) of the Public Health Service Act (42 USC 242b, 242k, and 242m(d)).

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CDC 57.125 (Front) Rev. 4, v6.4

Assess each CLABSI for CLIP adherence

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Monitoring Line Care and Maintenance

Observation examples

- How long has the line been in?
  - Does the RN know?
- Observe technique in hanging IVPB
  - Hand hygiene? Cleanse the port?
- Is the dressing dated?
- How long has the tubing been up?
- Are dressing changes performed using sterile technique?

CLABSI Prevention Outcome Measure

- Perform surveillance for CLABSI using NHSN standardized definitions and methods
- Use central line days to calculate infection rates

$$\frac{\text{\# of CLABSI}}{\text{Central line days}} \times 1000$$

- Compare your CLABSI rates over time to assess prevention progress
- Make comparisons only with similar patient populations (e.g. same unit with same type of patients over time)

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More coming in Epi/Surv presentation

CLABSI Surveillance Definition

Patient with a central line must meet one of the following criterion

1

Patient of any age

- ☐ has a recognized pathogen cultured from one or more blood cultures

and

- ☐ Organism cultured from blood is not related to an infection at another site

2

Patient of any age

- ☐ has common skin commensals cultured from 2 or more blood cultures drawn on separate occasions

and

has **at least one** of the following signs or symptoms

- ☐ Fever (> 38°C), chills, or hypotension

and

- ☐ Signs and symptoms and (+) lab results are not related to an infection at another site

3

Patient ≤ 1 year of age

- ☐ has common skin commensals cultured from 2 or more blood cultures drawn on separate occasions

and

has **at least one** of the following signs or symptoms:

- ☐ Fever (>38°C core), hypothermia (<36°C core), apnea, or bradycardia

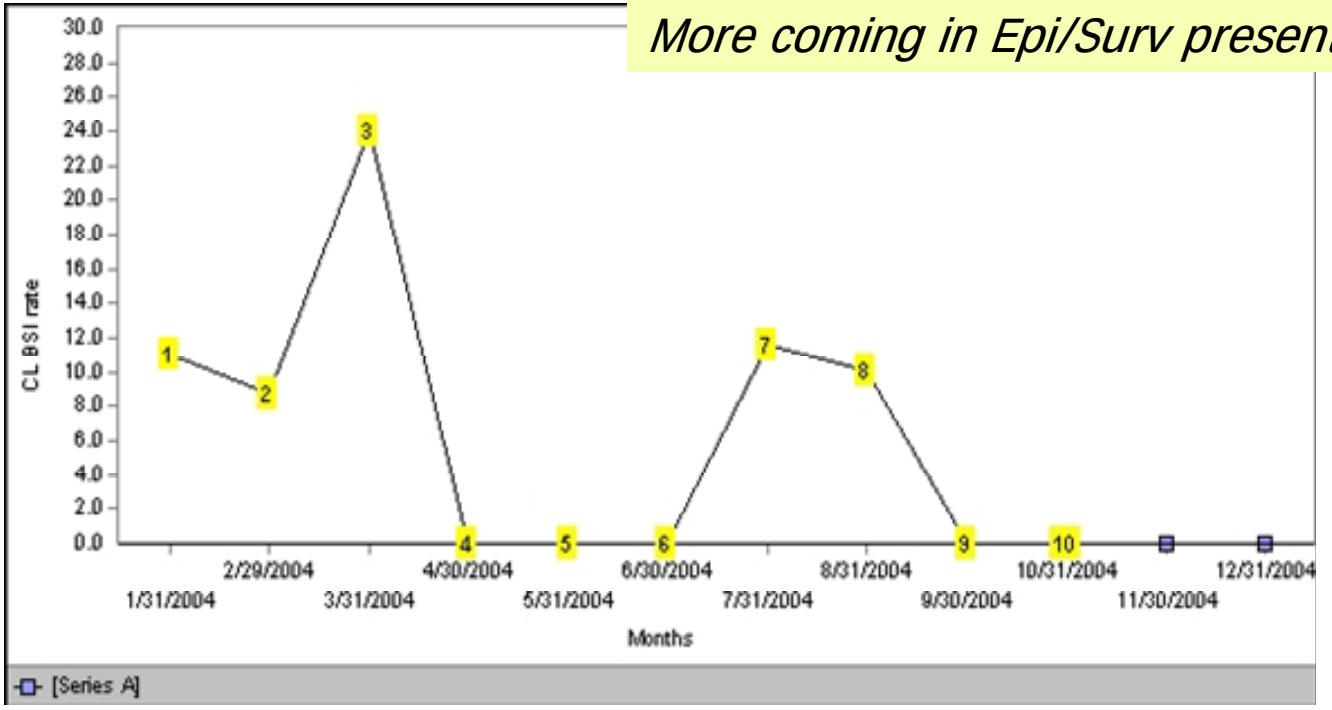
and

- ☐ Signs and symptoms and (+) lab results are not related to an infection at another

Measure CLABSI Prevention SUCCESS!

Example: Our Lady of Lourdes Hospital (Binghamton, NY)

More coming in Epi/Surv presentation



IHI 100,000 Lives Campaign, How-to Guide

The reductions here are clearly visible over time. During the course of one year, the rate of CR-BSIs decreased three-fold.

Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011

Naomi P. O'Grady, M.D.[1], Mary Alexander, R.N.[2], Lillian A. Burns, M.T., M.P.H., C.I.C.[3], Patchen Dellinger, M.D.[4], Jeffery Garland, M.D., S.M.[5], Stephen O. Heard, M.D.[6], Pame A. Lipsett, M.D.[7], Henry Masur, M.D.[1], Leonard A. Mermel, D.O., Sc.M.[8], Michele L. Pearson, M.D.[9], Issam I. Raad, M.D.[10], Adrienne Randolph, M.D., M.Sc.[11], Mark E. Rupp M.D.[12], Sanjay Saint, M.D., M.P.H.[13] and the Healthcare Infection Control Practices Advisory Committee (HICPAC)[14].

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CDC / HICPAC Guideline 2011

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SUPPLEMENT ARTICLE: SHEA/IDSA PRACTICE RECOMMENDATION

Strategies to Prevent Central Line–Associated Bloodstream Infections in Acute Care Hospitals

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PURPOSE

Previously published guidelines are available that provide comprehensive recommendations for detecting and preventing healthcare-associated infections. The intent of this document is to highlight practical recommendations in a concise format designed to assist acute care hospitals in implementing and prioritizing their central line–associated bloodstream infection (CLABSI) prevention efforts. Refer to the Society for Healthcare Epidemiology of America/Infectious Diseases Society of America "Compendium of Strategies to Prevent Healthcare-Associated Infections" Executive Summary and Introduction and accompanying editorial for additional discussion.

placed in emergency circumstances, repeatedly accessed each day, and often needed for extended periods.[1,2]

b. Non-ICU population: Although the primary focus of attention over the past 2 decades has been the ICU setting, recent data suggest that the greatest numbers of patients with central lines are in hospital units outside the ICU, where there is a substantial risk of CLABSI.[5,6]

2. Outcomes associated with hospital-acquired CLABSI

a. Increased length of hospital stay[6-10]

b. Increased cost; the non-inflation-adjusted attributable cost of CLABSIs has been found to vary from $3,700 to $29,000 per episode[7,10,11]

SHEA Compendium 2008

www.cdc.gov/hicpac/

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Questions?

For more information, please contact any HAI Liaison Team member.

Thank you